Pre-Prosthetic Surgery

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Objectives

• Definition.
• Objectives of preprosthetic surgery.
• Characteristics of ideal denture support.
• Treatment planning and examination.
• Preprosthetic surgical procedures.
• Surgical considerations and treatment plan for an immediate denture.
Definition

• Pre-Prosthetic surgery involves surgical procedures designed to optimize the retention, support, esthetic, stability and comfort of prostheses by the selective modification of soft and hard tissues.

Objectives

1. Provide adequate bony tissue support for the placement of RPD/CD (optimum ridge height, width and contour).
2. Provide adequate soft tissue support and optimum vestibular depth.
3. Elimination of pre-existing bony deformities.
   e.g. tori, prominent mylohyoid ridge and genial tubercle.
4. Elimination of pre-existing soft tissue deformities.
   e.g. epulis, flabby ridges and hyperplastic tissues.
5. Correction of maxillary and mandibular ridge relationship.
6. Relocation of frenal/muscle attachments.
7. Relocation of mental nerve.
Characteristics of ideal denture support

1. No evidence of intraoral or extraoral pathologic conditions.
2. Proper inter-arch jaw relationship in anteroposterior, transverse, and vertical dimensions.
3. Alveolar processes that are as large as possible and of proper configuration (the ideal shape of the alveolar process is a broad U-shaped ridge, with the vertical components as parallel as possible)
4. No bony or soft tissue protuberances or undercuts.
5. Adequate palatal vault form.

6. Proper posterior tuberosity notching.
7. Adequate attached keratinized mucosa in the primary denture-bearing area.
8. Adequate vestibular depth for prosthesis extension.
9. Added strength where mandibular fracture may occur.
11. Adequate bony support and attached soft tissue covering to facilitate implant placement when necessary.
Treatment planning and examination

I. **Extraoral examination:**
   (Facial esthetic examination)
   I. Presence of unsupported upper lip.
   II. Poor vermilion show.
   III. Loss of nasolabial fold or decreased nasolabial fold.
   IV. Poor/obtuse nasolabial angle with poor projection.
   V. Excessive lower lip show.
II. Intraoral examination (hard and soft tissues):

1. Ridge form and contour:
   a. Height and width of the ridge.
   b. Quality of the ridge—whether flabby, mobile tissue is present over the ridge.
   c. Presence of any gross irregularities in the ridge.
2. Presence of any exostosis, undercuts, prominences, tori, sharp mylohyoid ridge or severe resorption of external oblique ridge.
3. Buccal and labial, as well as lingual vestibules evaluation for depth and type of soft tissue.
4. Examination of palatal vault.
5. Tuberosity area - undercuts, hyperplastic tissue, flabby ridge, etc. Height, width, fibrous or excess bony tuberosity can impair the arch space for fabrication of full or partial denture.

6. Interarch relationship.
7. Adequate post-tuberosity notching.
8. The amount of keratinized tissue and poorly keratinized or freely movable tissue.
9. Inflammatory areas, scars, ulcers, hyperplastic tissues due to ill-fitting dentures should be looked for.
10. Frenal attachments in relation to the alveolar crest.
11. On the lingual aspect, mylohyoid muscle attachment and genioglossus muscle attachment should be checked.
12. Tongue size and movement is also important for the stability of the denture.
Treatment planning and examination

III. Radiographic examination:
1. OPG.
2. Lateral cephalometric radiograph.
3. Computed tomography:
   - Dental CT scan.
   - 3D CT-Scan.
   - CBCT.

IV. Diagnostic models:
Mounted on articulator with proper vertical dimension.

Preprosthetic surgical procedures

A. Alveolar Ridge Correction:
I. Recontouring of alveolar ridges:
   1. Simple Alveoloplasty Associated with Removal of Multiple Teeth
   2. Intraseptal Alveoloplasty
   3. Maxillary Tuberosity Reduction
   4. Buccal Exostosis and Excessive Undercuts
   5. Lateral Palatal Exostosis
   6. Mylohyoid Ridge Reduction
   7. Genial Tubercle Reduction
II. TORI REMOVAL:
   1. Maxillary Tori
   2. Mandibular Tori
III. Soft tissue abnormalities:
   1. Maxillary Tuberosity Reduction (Soft Tissue)
   2. Mandibular Retromolar Pad Reduction
   3. Lateral Palatal Soft Tissue Excess
   4. Unsupported Hypermobile Tissue
   5. Inflammatory Fibrous Hyperplasia
   6. Inflammatory Papillary Hyperplasia of the Palate
   7. Labial Frenectomy
   8. Lingual Frenectomy

B. Alveolar ridge augmentation.
C. Alveolar ridge extension (vestibuloplasty).
D. Alveolar ridge distraction.
A- Alveolar Ridge Correction

1- Simple Alveoloplasty

- Alveoloplasty refers to the surgical *recontouring* of the alveolar process.

- It can be primary and secondary alveoloplasty.
  - Primary alveoloplasty is always done at the time of single or multiple extractions.
  - Secondary alveoloplasty is done on the edentulous ridge late after the extraction.

- This procedure includes:
  a. Extraction of the tooth/teeth.
  b. Incision and reflection of the gingivae.
  c. Smoothing of alveolar bone by using bone File, rongeur forceps or bone Bur.
  d. Care of wound.
  e. Suturing of the mucoperiosteum.

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1- Simple Alveoloplasty

a Periapical radiograph of the region of the canine and first premolar of the mandible. b Clinical photograph. Supraeruption of teeth and a high alveolar ridge are noted.
1- Simple Alveoloplasty

a, b. Removal of wedge-shaped portions of mucosa from the alveolar ridge, from the area mesial and distal to the sockets

a, b. Reflection of the mucoperiosteum and removal of bone margins of the wound with a rongeur
1- Simple Alveoloplasty

a, b. Smoothing of the bone surface with a bone bur. a Diagrammatic illustration. b Clinical photograph

1- Simple Alveoloplasty

a, b. a Operation site after placement of sutures. b Postoperative clinical photograph 1 month after the surgical procedure
2- Intraseptal Alveoloplasty
*(Dean’s intraseptal alveoloplasty)*

- In this technique, the interseptal bone is removed followed by reposition of the labial cortical bone.
- This technique is used in areas of adequate bone height, but have undercut at the depth of the labial vestibule.
- This is done by reflecting mucoperiosteal flap by making buccal and lingual parallel incisions to remove the interdental papilla, which is chronically inflamed.
- The buccal mucoperiosteum is reflected to the level of the junction of free and attached mucosa with minimum elevation of the lingual mucoperiosteum. The interseptal bone is removed using rongeur or large surgical burs under copious saline irrigation, then digital compression is used to push the labial cortical bone inward, and the flap is repositioned back again and sutured.
- Continuous suture is used to stabilize the flap against the alveolar ridge and not only to approximate the mucosal margins.
3- Maxillary Tuberosity Reduction

- Enlarged tuberosity may involve either bone, soft tissues or both. Pre-operative X-ray is mandatory to rule out any pathological process (impacted teeth or fibrous dysplasia).
- A crestal incision is made behind the tuberosity (using blade No. 12) then the excess bone is removed using rongeur or surgical bur under copious saline irrigation. The area is smoothened with the bone file, and a wedge of the soft tissue is excised to allow proper soft tissue closure.
- The wound is closed with interrupted or continuous sutures.
- The most common complication of this procedure is opening of the maxillary sinus. If there is small opening, soft tissue coverage can be achieved easily as long as there is no infection.
3- Maxillary Tuberosity Reduction

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4-5 Removal of exostosis

• These are rare asymptomatic bony excrescences, usually localized at the buccal surface of the maxilla and mandible.

• No therapy is usually required, except for those cases where, due to the large size of the exostosis, severe esthetic and functional problems are created.

• In this technique a crestal incision extending 1-1.5 cm beyond the area requiring recontouring. Then the mucoperiosteal flap is raised and the underlying bone is recontoured with the use of rongeur forceps and rotary instruments, then bone file is used to smoothen the bone and the flap is then trimmed and sutured.
4-5 Removal of exostosis

6- Mylohyoid ridge reduction

- One of the common areas interfering with proper denture construction in the mandible is the mylohyoid ridge area. In addition to the actual bony ridge, with its easily damaged thin covering of mucosa, the muscular attachment to this area often is responsible for dislodging the denture.
- After L.A. A linear incision is made over the crest of the ridge in the posterior aspect of the mandible, a full-thickness mucoperiosteal flap is reflected, which exposes the mylohyoid ridge area and mylohyoid muscle attachments.
- The mylohyoid muscle fibers are removed from the ridge by sharply incising the muscle attachment at the area of bony origin. When the muscle is released, a rotary instrument with careful soft tissue protection or bone file can be used to remove the sharp prominence of the mylohyoid ridge.
6- Mylohyoid ridge reduction

7- Genial tubercle reduction

- As the mandible begins to undergo resorption, the area of the attachment of the genioglossus muscle in the anterior portion of the mandible may become increasingly prominent.
- Before a decision to remove this prominence is made, consideration should be given to possible augmentation of the anterior portion of the mandible rather than reduction of the genial tubercle.
- Local anesthetic infiltration and bilateral lingual nerve blocks should provide adequate anesthesia. A crestal incision is made from each premolar area to the midline of the mandible. A full-thickness mucoperiosteal flap is dissected lingually to expose the genial tubercle. The genioglossus muscle attachment can be removed by a sharp incision.
- Smoothing with a bur or a rongeur followed by a bone file removes the genial tubercle.
- The genioglossus muscle is left to reattach in a random fashion.
II- TORI REMOVAL

1- Maxillary tori:

• This is bony exostosis in the palatal area. It may present few problems with the presence of dentition, or become ulcerated from trauma to palate. In case of edentulous patient, tori interfere with proper design and function of the prosthesis.

• **Technique of removal:**
  
  1. A splint (stent) is fabricated before surgery (by taking an impression, removes the tori on the cast, and fabricates the splint as usual). This will help to prevent heamatoma formation after surgery.
  
  2. A short midline incision is carried through the mucosa to the underlying bone. 2 different incisions can be made:
     a) Single midline palatal incision.
     b) Double Y incision.

• Care should be taken with flap reflection, as the mucosa is thin in this area. If the mass is pedunculated and small, an osteotome or surgical bur is used to remove the bony mass.

• Larger tori should be sectioned into multiple fragments with rotary instrument under copious irrigation, the small fragments can be removed using rongeour or unibeveled osteotome or larger surgical bur, then bone file is used to smoothen the area. The flap is sutured after removing excess tissues.

• The surgical splint (stent) is placed and fixed in place by using regular retentive means or using circumzygomatic wiring or by screws in the palate. Usually this stent will help to prevent heamatoma formation. Gauze pack may help to hold the palatal mucosa in place instead of the stent.

• Complication of this procedure include necrosis of the thin palatal mucosa or fracture or perforation of the floor of the nose.
II- TORI REMOVAL
(Maxillary tori)

(a) Torus palatinus. (a) Diagrammatic illustration. (b) Clinical photograph.

(a, b) Surgical procedure for removal of torus palatinus. Incision along the midline of the palate with anterolateral and posterolateral incisions. (a) Diagrammatic illustration. (b) Clinical photograph.
II- TORI REMOVAL
(Maxillary tori)

a,b. Sectioning of the lesion into smaller parts using a fissure bur.
a Diagrammatic illustration. b Clinical photograph

a,b. Removal of the exostosis in fragments with a monobevel chisel.
a Diagrammatic illustration. b Clinical photograph
II- TORI REMOVAL
(Maxillary tori)

a,b. Torus palatinus. a Operation site after the placement of sutures. b. Postoperative clinical photograph immediately after removal of sutures

II- TORI REMOVAL
2- Mandibular tori:

– This may be presented as unilateral or bilateral lingual bony exostosis in the premolar area. It is located above the mylohyoid muscle origin bilaterally.
– Extremely large tori may interfere with normal speech or tongue function during mastication.
– Tori should be removed if they interfere with full or partial denture, or if there is ulceration over the covering mucosa or if they interfere with speech and deglutition.

• Technique of removal:
– Bilateral inferior alveolar nerve block and lingual nerve block provide anesthesia for tori removal.
– An envelop flap is done by making a crestal incision, which should be placed away from the tori as the overlying mucosa is very thin, and extending 1-1.5 cm beyond each end of the tori to be reduced.
II- TORI REMOVAL

– After flap reflection, small tori can be removed using an osteotome placed at the junction of the torus with the lingual plate (it is advisable to create a small trough with a surgical bur) or it can be grind off using surgical bur under copious saline irrigation.

– Large tori is removed by the use of round bur to create 3-4 mm deep groove between the tori and the mandibular lingual plate.

– Use osteotome to split the torus using minimal tapping force. A bone file is then used to smooth the bone.

– The excess tissues are then excised and the flap is closed with horizontal mattress sutures.

– Gauze pack is placed for 12 hours in the floor of the mouth to reduce postoperative hematoma formation

• Complication:
  – Hematoma formation and tearing of the thin lingual mucosa are the possible complications of this procedure.

a,b. Tori mandibularis in edentulous (a) and dentulous (b) patients
II- TORI REMOVAL
(Mandibular tori)

Incision along the alveolar ridge (without vertical releasing incisions)

Removal of exostoses with a bone bur

Smoothing of the bone surface with a bone file

Operation site after suturing
III- Soft tissue abnormalities

1. Maxillary tuberosity reduction (soft tissue):
   • The primary objective of soft tissue maxillary tuberosity reduction is to provide adequate interarch space for proper denture construction in the posterior area and a firm mucosal base of consistent thickness over the alveolar ridge denture-bearing area.
   • After L.A, an initial elliptic incision is made over the tuberosity in the area requiring reduction, and this section of tissue is removed.
   • After tissue removal the medial and lateral margins of the excision must be thinned to remove excess soft tissue, which allows further soft tissue reduction and provides a tension-free soft tissue closure.
III- Soft tissue abnormalities

2. Mandibular Retromolar Pad Reduction:
• Local anesthetic infiltration in the area requiring excision is sufficient. An elliptic incision is made to excise the greatest area of tissue thickness in the posterior mandibular area.
• Slight thinning of the adjacent areas is carried out with the majority of the tissue reduction on the labial aspect. Excess removal of tissue in the submucosal area of the lingual flap may result in damage to the lingual nerve and artery. The tissue is approximated with continuous or interrupted sutures.

III- Soft tissue abnormalities

3- Lateral palatal soft tissue excess:
• Soft tissue excess on the lateral aspect of the palatal vault often interferes with proper construction of the denture.
• L.A infiltrated in the greater palatine area and anterior to the soft tissue mass.
• With a sharp scalpel blade in the tangential fashion, the superficial layers of mucosa and underlying fibrous tissue can be removed to the extent necessary to eliminate undercuts in soft tissue bulk. After removal of this tissue, a surgical splint lined with a tissue conditioner can be inserted for 5 to 7 days to aid in healing.
III- Soft tissue abnormalities
(Removal of lateral palatal soft tissue excess)

Removal of lateral palatal soft tissue. A, View of excessive palatal tissue creating narrow palatal vault and undercut areas. B, Tangential excision of excess soft tissue.

III- Soft tissue abnormalities

4- Unsupported hypermobile tissue:
• Excessive hypermobile tissue without inflammation on the alveolar ridge is generally the result of resorption of the underlying bone, ill fitting dentures, or both.
• After L.A, removal of hypermobile tissue in the alveolar ridge area consists of two parallel full-thickness incisions on the buccal and lingual aspects of the tissue to be excised.
• Continuous or interrupted sutures are used to approximate the remaining tissue and are removed 7 days after surgery.
• Denture impressions can usually be taken 3 to 4 weeks after surgery.
• Hypermobile tissue in the crestal area of the mandibular alveolar ridge frequently consists of a small cordlike band of fibrous connective tissue which can be elevated by using pickups and removed by scissors. Generally, no suturing is necessary for this technique, and a denture with a soft liner can be reinserted immediately.
III- Soft tissue abnormalities
(Unsupported Hypermobile Tissue)

5. Inflammatory fibrous hyperpalsia (denture fissuratum):
   • This result from ill fitted denture. In early stage, no surgery is required and the correction of the ill fitted denture with use of soft liner is sufficient to eliminate this tissues. If fibrosis exist or the size is getting bigger, then surgical excision is the treatment of choice.
   • Technique:
     – L.A. When the area to be excised is minimally enlarged, electrosurgical or laser techniques provide good results for tissue excision.
     – If extensive tissue mass exists, the lesion is grasped with tissue forceps and is gradually excised along the length of the lesion superficial to the underlying periosteum. the portion of mucosa that has not been reflected, found at the margin of the lesion is sutured with the intact periosteum along its entire length.
     – After the surgical procedure, and after being lined with a tissue conditioner, the denture is inserted into the mouth and is continuously worn until the day the sutures are removed.
III- Soft tissue abnormalities
Inflammatory fibrous hyperpalsia (denture fissuratum)

a, b. Extensive fibrous hyperplasia of the mucosa as a result of ill-fitting dentures.
a Diagrammatic illustration. b Clinical photograph

III- Soft tissue abnormalities
Inflammatory fibrous hyperpalsia (denture fissuratum)

a, b. Removal of the lesion in segments with a scalpel. a Diagrammatic illustration. b Clinical photograph
III- Soft tissue abnormalities
Inflammatory fibrous hyperpalsia (denture fissuratum)

a, b. Suturing of the wound margins with periosteum that has not been reflected, which remains, avoiding a decrease in the depth of the mucobuccal fold. a Diagrammatic illustration. b Clinical photograph

Replacement of old denture, immediately after the end of the operation, retaining the depth of mucosa of the newly created sulcus. The internal surface of the denture is lined with tissue conditioner.
a. Diagrammatic illustration. b Clinical photograph
III- Soft tissue abnormalities

6. Inflammatory papillary hyperplasia of the palate:
   - This results from mechanical irritation, poor oral hygiene and fungal infection. It appears as multiple nodular projections in the palatal tissues.

   • Technique:
     - Proper denture adjustment may eliminate or reduce the condition.
     - If surgery is indicated, an excision superficial to the periostium is recommended using electrocautery loops. In addition, abrasion of the superficial layer of the palatal mucosa using acrylic or bone bur in a handpiece may be effective.
     - After removal of the tissue, insertion of a splint or denture containing soft tissue liner provides improved patient comfort during the healing period. Secondary epithelialization usually takes place in approximately 4 weeks.
III- Soft tissue abnormalities

Inflammatory papillary hyperplasia of the palate

Diagrammatic illustrations showing removal of the lesion with an electrosurgical loop

7. Labial frenectomy:

- Labial frenal attachments consist of thin bands of fibrous tissues covered with mucosa extending from the lip and check to the alveolr periosteum. It's attachment varies from the height of the vestibule to the crest of the alveolar ridge and may extend to the incisal papilla area in the anterior maxilla.
- In the presence of the dentition, the frenal attachment do not present problems, but denture construction may be complicated by it's high attachment as it may create areas of discomfort and ulceration and may interfere with the peripheral seal or dislodge the denture.
- Techniques effective in removal of frenal attachment:
  A. Simple excision technique.
  B. Z-plasty technique.
  C. Localized vestibulo-plasty with secondary epithelialization.
  D. Laser-assisted frenectomy.
- The first two techniques (simple excision and Z-plasty) are effective when the mucosal and fibrous tissue band is relatively narrow; the third (a localized vestibuloplasty with secondary epithelialization) is often preferred when the frenal attachment has a wide base.
III- Soft tissue abnormalities

A) Simple excision:

- Care must be taken to avoid excessive anesthetic infiltration directly in the frenum area, as it may obscure the anatomy that must be visualized at the time of excision.

- After a narrow elliptic incision around the frenal area down to the periosteum is completed. The fibrous frenum is then sharply dissected from the under lying periosteum and soft tissue, and the margins of the wound are gently undermined and reapproximated.

- Placement of the first suture should be at the maximal depth of the vestibule and should include both edges of mucosa and underlying periosteum at the height of the vestibule beneath the anterior nasal spine. This will reduce hematoma formation and allow for adaptation of the tissue to the maximal height of the vestibule.

Labial frenectomy (simple excision)

a,b. The superior and inferior margins of the frenum are grasped using curved mosquito hemostats. a Diagrammatic illustration. b Clinical photograph
III- Soft tissue abnormalities
Labial frenectomy (simple excision)

Initial step in excision of the frenum with a scalpel in contact with the posterior surface of the lower hemostat and then the upper hemostat a Diagrammatic illustration. b Clinical photograph

Undermining and suturing of wound margins
III- Soft tissue abnormalities

B) Z-Plasty technique:
- After excision as in the the simple technique, two oblique incision in Z-fashion, one on each end of the previous area of excision. The two pointed flap are undermined and rotated to close the initial vertical incision horizontally.

C) Localized vestibuplasty with secondary epithelilization
- After L.A, an incision is made through mucosal tissue and underlying submucosal tissue, without perforating the periosteum.
- A supraperiosteal dissection is completed by undermining the mucosal and submucosal tissue with scissors. The edge of the mucosal flap is sutured to the periosteum at the maximal depth of the vestibule and the exposed perioseum is allowed to heal by secondary epithelialization.
- A surgical splint or denture containing soft tissue liner is often useful in the initial healing period.
III- Soft tissue abnormalities
Localized vestibuplasty with secondary epithelilization

Laser-assisted frenectomy
III- Soft tissue abnormalities

8. Lingual frenectomy:
   • An abnormal lingual frenal attachment consists of mucosa, dense fibrous connective tissues, fibers of genioglossus muscle and it extends from the tip of the tongue to the posterior surface of mandibular alveolar ridge and it may affect speech and denture stability
   • Technique of removal
     – After a bilateral lingual nerve block, the tongue is retracted upwards and posteriorly with a traction suture that is passed through the tip of the tongue.
     – The frenum is then grasped approximately at the middle of the vertical length with a straight hemostat, which is parallel to the floor of the mouth.
     – Using a scalpel, the clasped portion of tissue is excised, first above the hemostat and then below with careful attention is given to the blood vessels at the inferior aspect of the tongue and floor of the mouth also to the submandibular duct opening.
     – The wound margins are then undermined with scissors and interrupted sutures are placed.

III- Soft tissue abnormalities

Lingual frenectomy

a Lingual frenum (ankyloglossia) requiring surgical intervention. b Elevation of the tongue with the aid of a suture and retraction of the frenum with a straight hemostat, to facilitate removal
III- Soft tissue abnormalities

Lingual frenectomy

First step in frenectomy. The scalpel is always in close contact with the upper surface of the hemostat. a Diagrammatic illustration. b Clinical photograph

a Surgical field after removal of the frenum. b Undermining the mucosa at wound margins from underlying tissues.
III- Soft tissue abnormalities

Lingual frenectomy

Operation site after the placement of sutures

B- Alveolar ridge augmentation

1. Mandibular augmentation:
   1. Superior Border Augmentation
      – Indications of superior border augmentation:
         a) Severe resorption of the mandible results in inadequate height and contour.
         b) Potential risk of fracture mandible.
         c) When the treatment plan calls for placement of implants in areas of insufficient bone.
         d) Neurosensory disturbances from inferior alveolar nerve dehiscence at the location of the mental foramen or at the superior aspect of the mandible.
      – Technique:
        • The use of autogenous corticocancellous blocks of iliac crest bone secured to the mandible with small rigid fixation screws, minimizing graft mobility. Tissue-guided regeneration with the use of a membrane is often combined with the bony augmentation. In some cases implants can be placed at the same time the bone graft augmentation is completed.
B- Alveolar ridge augmentation

2. Augmentation of the mandible with bone grafting materials.
   - Autogenous bone remains the cold standard for reconstruction, but the problems associated with bone grafting, including resorption, donor-site morbidity, and the need for hospitalization.
   - Allogenic bone grafts procured from cadavers or Xenografts from a processed bovine source can facilitate osteoconduction rather than osteoinduction.
   - Alloplastic material e.g. HA is a dense biocompatible material that can be produced synthetically or obtained from biologic sources such as coral can be used for augmenting alveolar ridge contour defects.
B- Alveolar ridge augmentation

• HA augmentation of the mandible can be performed on an outpatient basis. A subperiosteal tunnel technique is used, which exposes the entire aspect of the mandible in the area to be augmented but carefully avoids the neurovascular bundles. After the tunnel is created, a preloaded beveled syringe containing bone grafting material is inserted into the most posterior aspect of the tunnel; then the HA is injected until the desired contour of the mandible is obtained.
• Similarly insertion of the HA from each lateral incision area augments the anterior area of the mandible.
• A splint, constructed on a cast that has been waxed to the desired contour of the mandible after augmentation, is secured in place with circummandibular sutures for 7 to 10 days.

Diagrammatic representation of hydroxyapatite (HA) augmentation procedure. A, Vertical incisions placed anterior to mental nerve area. Subperiosteal tunnels are then developed in posterior and anterior areas. Retraction sutures are used to elevate margins of incision. B, Injection of HA into subperiosteal tunnels. C, Soft tissue closure.
B- Alveolar ridge augmentation

3. Guided Bone Regeneration (Osteopromotion):
   • A membrane (nonresorbable or resorbable) is used to cover an area where bone graft healing or bone regeneration is desired. The concept of guided regeneration, or osteopromotion, is based on the ability to exclude undesirable cell types, such as epithelial cells or fibroblasts, from the area where bone healing is taking place.
   • Many types of materials have been used as membrane coverings. Currently, expanded polytetrafluoroethylene or cortex is the most nonresorbable membrane used.
   • Resorbable membranes such as polylactin and collagen have been used to eliminate the need for membrane removal.

B- Alveolar ridge augmentation

II. Maxillary augmentation:
   1. Onlay Bone Grafting:
      – Maxillary onlay bone grafting is indicated primarily when severe resorption of the maxillary alveolus is seen that results in the absence of a clinical alveolar ridge and loss of adequate palatal vault form.
      – Maxillary onlay grafting currently is usually accomplished using corticocancellous blocks of iliac crest bone. The blocks can be secured to the maxilla with small screws, eliminating mobility and decreasing resorption.
      – Cancellous bone is then packed around the grafts to improve contour. Implants can be placed at the time of grafting in some cases, but placement is often delayed to allow initial healing of the grafted bone.
B- Alveolar ridge augmentation

2. Interpositional Bone Grafts:
   - Is indicated in the bone-deficient maxilla, where the palatal vault is found to be adequately formed but ridge height is insufficient.
   - Augmentation is completed by down-fracturing maxilla (Le Fort I osteotomy) and placing interpositional graft using autogenous iliac crest. The maxilla is stabilized using rigid fixation plates.
   - Disadvantages of this type of procedure include the need to harvest bone from an iliac crest donor site and possible secondary soft tissue surgery.
B- Alveolar ridge augmentation

3. Augmentation of the maxilla with bone grafting materials:
   – Bone grafting material e.g. HA is placed into the maxilla in a technique similar to that described for mandibular augmentation.

4. Sinus lift:
   – An opening is made in the lateral aspect of the maxillary wall, and the sinus lining is carefully elevated from the bony floor of the sinus. Allogeneic bone, autogenous bone, xenogeneic bone, or a combination of these materials can be used as a graft source in these areas. The current method of choice usually incorporates some autogenous bone material in the sinus graft. The graft is allowed to heal for 3 to 6 months, after which the first stage of implant placement can begin in the usual fashion.
B- Alveolar ridge augmentation

Augmentation of the maxilla with bone grafting materials

Sinus lift procedure

C- Alveolar ridge extension (vestibuloplasty)

• Whenever there is an inadequate vestibular depth present, (due to mandible/maxilla atrophy and high muscle and soft tissue attachments) to increase the retention and stability of the denture, deepening of the vestibule is considered.
• Deepening of the vestibule without any addition of the bone is termed as vestibuloplasty or sulcoplasty or sulcus deepening procedure. Vestibuloplasty can be done in the maxilla or in the mandible or in both the jaws.
• This soft tissue surgery may be carried out alone or may be done after bony augmentation
C- Alveolar ridge extension (vestibuloplasty)

1. Mandibular techniques:
   1. Transpositional flap vestibuloplasty (Lip Switch, Kazanjian technique):
      • In this procedure a mucosal flap pedicled from the alveolar ridge is elevated from the underlying tissue and sutured to the depth of the vestibule. The inner portion of the lip is allowed to heal by secondary epithelialization.
      • When adequate mandibular height exists, this procedure increases the anterior vestibular area, which improves denture retention and stability.
        — **Indications for the procedure include:**
          1. Adequate anterior mandibular height (at least 15 mm).
          2. Inadequate facial vestibular depth from mucosal and muscular attachments in the anterior mandible.
          3. The presence of an adequate vestibular depth on the lingual aspect of the mandible.
        — **Disadvantages include:**
          1. Unpredictability of the amount of relapse of the vestibular depth.
          2. Scarring in the depth of the vestibule.
          3. Problems with adaptation of the peripheral flange area of the denture to the depth of the vestibule.

• Transpositional flap vestibuloplasty (i.e., lip switch). A, Incision is made in labial mucosa, and thin mucosal flap is dissected from underlying tissue. Supraperiosteal dissection is also performed on anterior aspect of the mandible. B, Flap of labial mucosa is sutured to depth of vestibule. Exposed labial tissue heals by secondary intention. C, Modification of technique by incising periosteum at crest of alveolar ridge and suturing free periosteal edge to denuded area of labial mucosa. D, Mucosal flap is then sutured over denuded bone to periosteal junction at depth of vestibule.
C- Alveolar ridge extension (vestibuloplasty)

Transpositional flap vestibuloplasty

Modification of Kazanjian technique:

- **Clark’s technique:**
  1. An incision is started slightly labial to the crest along the alveolar ridge.
  2. Mucosal flap based on the inner aspect of the lip is undermined, till vermilion border, to ensure adequate mobility and overcorrection.
  3. Supraperiosteal dissection is done, along the labial surface of the alveolar bone till the desired vestibular depth. Edge of the mobilized flap is pushed into the new vestibular depth area and held in position by sutures passed through the chin area extraorally and tied around cotton roll or rubber catheter placed below the chin.
  4. As the alveolar bone is covered by periosteal layer, it heals quickly by granulation.
  5. Success rate is better than Kazanjian method
C- Alveolar ridge extension  
(vestibuloplasty)  

b) Vestibule and Floor-of-Mouth Extension Procedures  
   - In addition to the attachment of labial muscles and soft tissues to the denture-bearing area, the mylohyoid and genioglossus muscles in the floor of the mouth present similar problems on the lingual aspect of the mandible.  
   - **Trauner** described detaching the mylohyoid muscles from the mylohyoid ridge area and repositioning them inferiorly, effectively deepening the floor of the mouth area and relieving the influence of the mylohyoid muscle on the denture.  
   - **Obwegeser** later described the effective use of a labial extension procedure combined with Trauner's procedure to provide maximal vestibular extension to both the buccal and lingual aspects of the mandible. The technique for extension of the labial vestibule is a modification of a labial pedicled supraperiosteal flap described by Clark.
C- Alveolar ridge extension (vestibuloplasty)

• **Obwegeser's Technique (Combination of Buccal and Lingual Vestibuloplasty):**
  - Incision is given on the alveolar ridge.
  - Mucosal flap raised buccally and lingually.
  - Mylohyoid muscle attachment and only superficial fibres of genioglossus muscle are separated on the lingual side.
  - Edges of buccal and lingual flaps attached/ sutured to each other, below inferior border of the mandible.
  - Skin graft, full thickness buccal mucosal graft or palatal mucosal graft depending on the size of the area to be covered is placed over entire alveolar ridge.
  - Preformed acrylic stent/ denture placed and fixed to the mandible, with circummandibular wiring.

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C- Alveolar ridge extension (vestibuloplasty)

• **Indications:**
  1. when adequate alveolar ridge for a denture bearing area is lost but at least 15 mm of mandibular bone height remains.
  2. The remaining bone must have adequate contour so that the form of the alveolar ridge exposed after the procedure is adequate for denture construction.

• **Disadvantages:**
  1. The need for hospitalization and donor-site surgery.
  2. Moderate swelling and discomfort experienced by the patient postoperatively.
  3. Patients may complain about the appearance or function of skin in the oral cavity.
  4. If the skin graft is too thick at the time of harvesting, hair follicles may not totally degenerate, and hair growth may occasionally be seen in isolated areas of the graft.
C- Alveolar ridge extension (vestibuloplasty)

Obwegeser's technique

2. Maxillary techniques:
   a) Submucosal Vestibuloplasty:
      – This technique is particularly useful when maxillary alveolar ridge resorption has occurred but the residual bony maxilla is adequate for proper denture support.
      – A midline incision is made in the anterior maxilla, and the mucosa is undermined and separated from the underlying submucosal tissue.
      – A supraperiosteal tunnel is then developed by dissecting the muscular and submucosal attachments from the periosteum.
      – The intermediate layer of tissue created by the two tunneling dissections is incised.
      – After closure of the midline incision, a preexisting denture or prefabricated splint is modified to extend into vestibular areas to the desired depth and is secured with palatal screws for 7 to 10 days.
C- Alveolar ridge extension (vestibuloplasty)

b) Maxillary vestibuloplasty with tissue grafting:
   - When insufficient labiovestibular mucosa exists and lip shortening would result from a submucosal vestibuloplasty technique, other vestibular extension techniques must be used. In such cases a modification of Clark’s vestibulo-plasty technique using mucosa pedicled from the upper lip and sutured at the depth of the maxillary vestibule after a supraperiosteal dissection can be used.
   - The denuded periosteum over the alveolar ridge heals by secondary epithelialization. Longer healing time is required (6 to 8 weeks) before denture construction.
   - Maintenance of the maxillary vestibular depth is unpredictable. The use of a labially pedicled mucosal flap combined with tissue grafting over the exposed periosteum of the maxilla provides the added benefits of more rapid healing over the area of previously exposed periosteum and more predictable long-term maintenance of vestibular depth.
Surgical considerations and treatment plan for an immediate denture

• An immediate denture is “a complete denture or removable partial denture fabricated for placement immediately after the removal of natural teeth”

Advantages:
1. The insertion of a denture after extraction offers immediate psychologic and esthetic benefits to patients.
2. The immediate insertion of a denture after surgery also functions to splint the surgical site, which results in the reduction of postoperative bleeding, edema and improved tissue adaptation to the alveolar ridge.
3. The vertical dimension can be most easily reproduced with an immediate denture technique.

Disadvantages: include the need for frequent alteration of the denture postoperatively and the construction of a new denture after initial healing has taken place.

Technique:
1. Extraction of the posterior dentition in the maxilla and the mandible done before anterior extraction.
2. After the initial healing period of the posterior segments, new records are taken and models are mounted on a semi-adjustable articulator.
3. After replacement of the model teeth with prosthetic teeth, the cast of the alveolar ridge area is then carefully recontoured.
4. A clear acrylic splint is fabricated from the casts to replicate the desired alveolar ridge form. The dentures are also constructed on these casts.
5. Extraction of anterior teeth.
6. An intraseptal alveoloplasty, preserving as much vertical height and cortical bone as possible, is generally indicated.
7. After the bony recontouring and elimination of gross irregularities is completed, the tissue is approximated with digital pressure.
Surgical considerations and treatment plan for an immediate denture

8. The clear acrylic surgical guide constructed on the presurgical casts is inserted. Any areas of tissue blanching or gross irregularities are then reduced until the clear surgical guide is adapted to the alveolar ridge in all areas.

9. Incisions are closed with continuous or interrupted sutures.

10. The immediate denture with a soft liner is inserted.

11. The occlusal relationships are checked and adjusted as necessary.

12. The patient is instructed to wear the denture continuously for 24 hours and to return the next day for a postoperative check.

13. Bupivacaine or another similar long-acting L.A injected at the conclusion of the surgical procedure greatly improves comfort in the first 24-hour post-operative period. At that time the denture is gently removed, and the underlying mucosa and alveolar ridge areas are inspected for any areas of excessive pressure.

14. The denture is cleaned and reinserted, and the patient is instructed to wear the denture for 5 to 7 days and to remove it only for oral saline rinses. Sutures are generally taken out 7 days postoperatively.
Immediate denture